
# MAJOR CZM PERMIT APPLICATION

## Environmental Assessment Report

**Applicant**: Government of the US Virgin Islands – Dept. of Public Works
**Project**: VI ST ER STX(003): Storm Damage Repair to Roadways, Culverts, Embankments, Bridges, and Other Roadway Features on St. Croix, USVI

**Site:** Rt. 80 East Culvert

## JANUARY 2022

Prepared by: Tysam Tech, LLC

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## 1.00 NAME AND ADDRESS OF APPLICANT

# Government of the US Virgin Islands
# Department of Public Works

**Mailing Address:**
6002 Annas Hope
Christiansted, VI 00820

**Physical Address:**
6002 Annas Hope
Christiansted, VI 00820

# 2.00 LOCATION OF PROJECT

The project is located at the following physical address:

**Rt. 80 East Culvert – North Shore Road**
**Christiansted, VI 00820**

The Rt. 80 East Culvert project site is located in St. Croix, Estate Clairmont (East). The site is positioned at 17°46'47.9"N, 64°46'19.9"W, on Route 80, west of Salt River Bay. The Location and Agency Review Map is Figure 2.00.1 below and Figure 2.00.2 establishes the areas of Coastal Zone Management (CZM) first tier jurisdiction (in red) in relation to the project site.

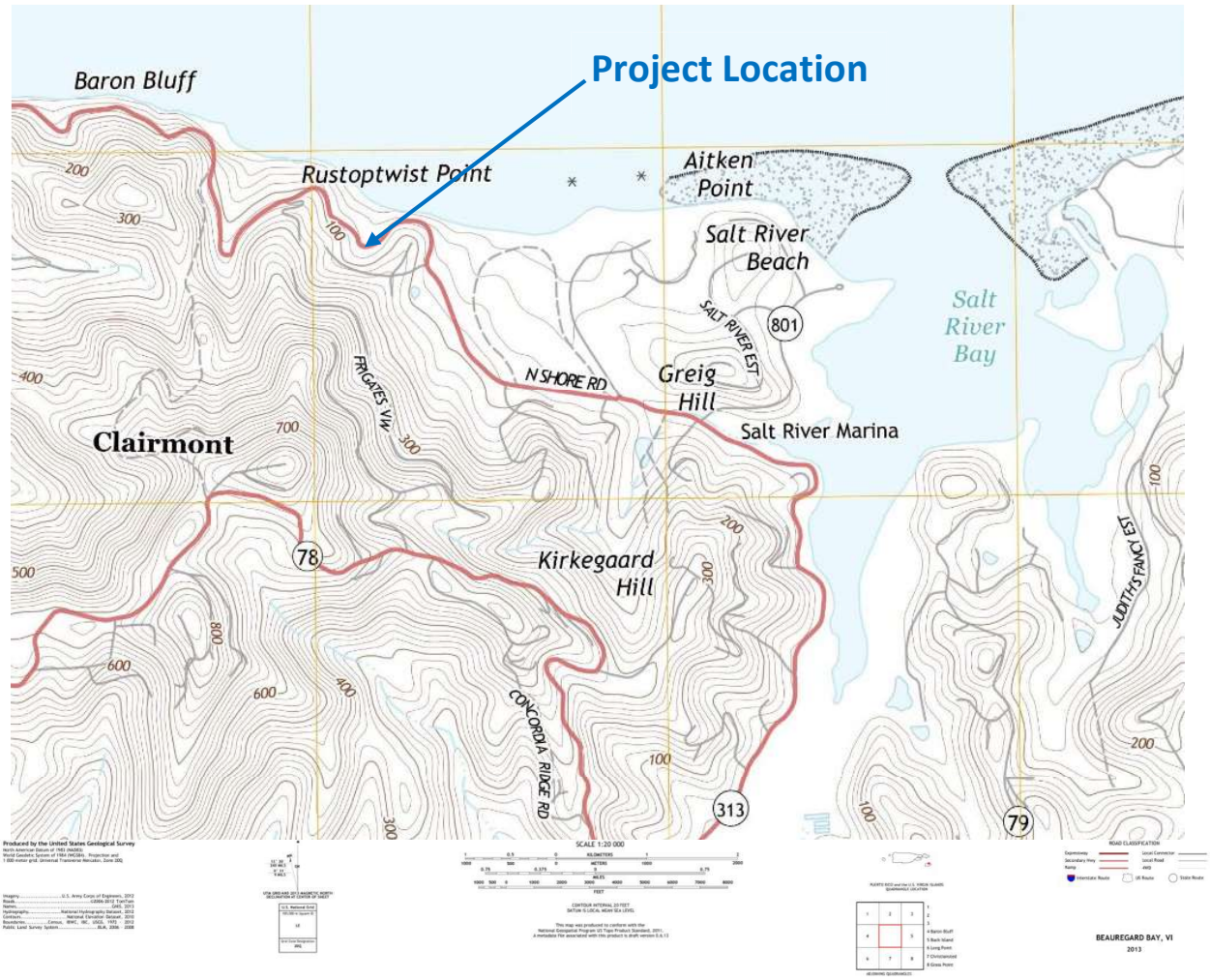



*Figure 2.00.1 – Location and Agency Review Map (USGS Quadrangle Map, Baron Bluff, VI, 2013)*


*Figure 2.00.2 –Vicinity Map Showing Location of Facility (Google Earth).*

# 3.00 ABSTRACT


**SUMMARY OF WORK FOR ALL 15 SITES**

Significant damage to roads, gut crossings and bridges occurred as a result of the landfall of Hurricane Maria in 2017 to the island of St. Croix, USVI. To provide the necessary repair to the damaged infrastructure, the USVI Department of Public Works (DPW) has contracted VI Paving, Inc. (VIP) to undertake the repairs at 15 different sites around St. Croix. These sites consist of different types of rehabilitation work and different project scale. Of the 15 sites, three are bridge rehabilitations, seven are culvert rehabilitations, and the remaining five are strictly roadway rehabilitations. This project is funded through the US Department of Transportation (USDOT), Federal Highway Administration, Eastern Federal Lands Highway Division and is in partnership with the USVI Department of Public Works (DPW).

The project involves the removal of damaged asphalt and concrete pavement, pipe culverts, bridges, guardrails, retaining walls, embankment material, utility lines and poles, and other debris. The damaged infrastructure will be replaced by new culverts, bridges, headwalls, guardrails, rip rap and gabion baskets, concrete retaining walls, embankment stabilization materials, drainage inlets, aggregate base, asphalt pavement, and concrete pavement. Also included in the scope of work is the

clearing and cleaning of existing drainage structures and the reconditioning of shoulders and ditches. The aforementioned activities will restore the proposed project areas to full and improved function and prevent similar damage to occur during future storm events.

**RT. 80 EAST CULVERT – NORTH SHORE ROAD**

For this particular site under project VI ST ER STX(003), 332 linear feet of roadway on Rt. 80 North Shore Road will be rehabilitated. The existing 48-inch corrugated metal pipe (CMP) culvert will be removed and replaced with three 36-inch HDPE pipe culverts. The current culvert outlet elevation is higher than the inlet elevation. This will be corrected during installation with a proposed 2% slope downward to new culvert outlet. Concrete headwalls on both sides of the roadway will be replaced. A concrete drop inlet will replace the headwall on the south side. The damaged guardrail will also be removed and replaced. Gabion baskets will support the headwall at the outlet, with additional rip rap installed at the culvert outlet to provide improved stability.

The proposed construction will remain within the footprint of the existing roadway.

**Project Assurances**

- Employees' and the public's health and safety are protected with the best available systems and technologies.
- Environmental impact is considered at all times.
- No significant negative impact to environment.
- Air quality is protected.
- Stormwater quality is protected.
- Nearshore water quality is protected.

# 4.00 STATEMENT OF OBJECTIVES SOUGHT BY THE PROPOSED PROJECT

VIP seeks to repair and rehabilitate the referenced section of roadway by removing and replacing the existing culvert, headwalls, and guardrail which were compromised during Hurricane Maria. The replacement of these structures will prevent future damage to the roadway and related infrastructure.

# 5.00 DESCRIPTION OF PROJECT

## 5.01 SUMMARY OF PROPOSED ACTIVITY

### *a) Purpose of Project*

The purpose of the project is to rehabilitate a 332-foot section of roadway which was damaged from Hurricane Maria in 2017. The project area is a section of North Shore Road, Route 80. The existing 48-inch CMP culvert will be removed and replaced with three 36-inch HDPE pipe culverts. The slope will be corrected by placing culvert outlet at lower elevation than the inlet to improve drainage. Concrete headwalls will be replaced on both shoulders, with gabion baskets and additional rip rap installed at the outlet spillway to further stabilize the culvert outlet.

### *b) Presence and Location of any Critical Areas and Possible Trouble Spots*

The project area is in a fairly rural section along the north shore of St. Croix, with few developed properties in the area. However, the roadway is less than 500 feet from the shoreline and sits on relatively steep slopes. Due to the proximity to the water, the clearing of debris and repair of the roadway has potential to cause impact to the surrounding areas, existing habitats and wildlife.

Site slope is 20-40%. Elevation is approximately 65 to 80 feet above sea level.

A review of the U.S. Fish & Wildlife Information for Planning and Consultation (IPaC) indicate two federally endangered reptile species that are known to swim in the offshore waters, less than 500 feet north of the project area. They are the hawksbill sea turtle (*Eretmochelys imbricata*) and the leatherback sea turtle (*Dermochelys coriacea*). In addition, the West Indian manatee (*Trichechus manatus*) is a threatened species and has been found in the offshore waters near the project site as well.

There is no data for water quality in the area as there have been no recent water samples taken in the area. The USVI_2018 303d list show no samples taken from the subject water body in recent years.

Due to the nature of the project scope of road rehabilitation, there exists potential for sedimentation and erosion during project activities. However, appropriate protective Best Management Practices (BMPs) will be employed through the entire project timeline in accordance with minimum requirements of the VI Environmental Protection Handbook (2002). As the project footprint is essentially identical to the existing infrastructure, there are no anticipated impacts to stormwater and air quality, and work can be done quickly and with minimal site disturbance.

The BMPs that will be used are designed to meet the minimum standards of the VI Environmental Protection Handbook (2002).

## *c) Proposed Method of Land Clearing*

Any brush and debris requiring removal in order to access the existing road and related infrastructure, will be cut and transported off-site as green waste for disposal at the Waste Management Authority Transfer Station. Earth work will be limited to scraping the road surface and excavating the culvert, with some shoulder clearing for machine access clearance.

## *d) Plans for Topsoil and Site Disturbance Provisions*

Topsoil and site disturbance will be minimized during the construction timeline. The project will focus within the existing footprint of the road along the 332-foot length as depicted in the site drawings.

Some soil removal and compaction will occur to stabilize for the additional rip rap placement, but will be protected and stabilized throughout the project timeline. The site will otherwise see no topsoil or site disturbance.

A Storm Water Pollution Prevention Plan (SWPPP) complying with the Department of Planning and Natural Resources' Construction General Permit requirements will be implemented during project activities.

## *e) Erosion and Sediment Control Devices to be Implemented*

The following BMPs will be implemented on-site to control runoff and protect natural resources:

**Silt Fence –** Due to the steep slopes and working in a drainage route, silt fencing shall be used to protect the downstream vegetated areas and control runoff and sediment loss on the north side of the road.

**Containment Berms –** A containment berm will be constructed, if needed, to support the silt fencing in containing stormwater and retaining sediment.

Design of these BMPs will follow the minimum standards of the VI Environmental Protection Handbook (2002).

## *f) Schedule for Earth Changing Activities & Implementation of Erosion/Sediment Control Measures*

No earth change activities will take place until the BMPs are installed at the site. Erosion and Sediment control for construction will be managed as follows:

1. Ensure silt fencing and any other BMPs are setup before work begins.
2. Minimize earth work in the removal of the existing CMP culvert and replacement with three 36" HDPE pipe culverts.
3. Minimize time for replacement of concrete headwalls and guardrail.
4. Minimize re-stabilization time for shoulder and culvert outlet to install additional riprap.
5. Compact and re-asphalt the road before removing silt fencing and/or berms.

## *g) Maintenance of Erosion and Sediment Control*

Sediment control devices, such as dikes, swales, outlets and other BMPs will be inspected every 14 calendar days and after all heavy rainfall of 0.25 inches or more. If defects and/or damage are noted in the measures, the defect or damage will be immediately reported and repaired. If the measures prove to be inadequate to control erosion, changes will be made to the design and additional measures will be added as necessary.

Accumulated sediment will be removed when it reaches 40% of the height of the silt fencing. Worn, torn or otherwise damaged silt fencing will be fixed or replaced. The site will be cleaned on a daily basis of litter, debris and materials such as paper, wood, concrete, etc.

Accumulated sediment will be removed in accordance with the approved SWPPP requirements.

## *h) Stormwater Management*

No proposed changes to stormwater flows, quantities or direction are proposed for this project.

Management of stormwater for the duration of the project will be limited to ensuring no discharge of contaminated stormwater from the site boundaries, and prevention of erosion of project areas through controlled release from site discharge points.

All stormwater control devices will be inspected every 14 calendar days and after all heavy rainfall of 0.25 inches or more. If defects or damage are noted in the measures, the defect or damage will be immediately reported and repaired. If the measures prove to be inadequate to control stormwater flow, changes will be made to the design and additional measures will be added as necessary.

## *i) Maintenance Schedule of Stormwater Facilities*

Sediment control devices, including dikes swales, and outlets, will be inspected every 14 calendar days and after any heavy rainfall of 0.25 inches or more. If defects or damage are noted in the measures, the defect or damage will be immediately reported and repaired. If the measures prove to be inadequate to control erosion, changes will be made to the design and additional measures will be added as necessary.

Accumulated sediment will be removed when it reaches 40% of the height of the silt fencing, and in accordance with the approved SWPPP requirements. Worn, torn or otherwise damaged silt fencing will be fixed or replaced. The site will be cleaned on a daily basis of litter, debris, and materials such as paper, wood, concrete, etc.

## *j) Sewage Disposal*

Project sewage management will be limited to maintaining portable restrooms on site, and ensuring they are emptied by a qualified waste management company at an appropriate frequency to avoid spills or discharges from the site.

There are no existing sewer lines (either private or municipal) in the area.

## 5.02 SITE PLANS (See Attached Drawings)

*5.02.01 Lot Layout (See Attached Engineer/Surveyor drawings)*

*5.02.02 Road Layouts (See Attached Engineer/Surveyor drawings)*

*5.02.03 Position of Structures (See Attached Engineer/Surveyor drawings)*

*5.02.04 Septic System/wastewater Treatment (Not Applicable)*

*5.02.05 Stormwater Drainage (See Attached Engineer/Surveyor drawings)*

*5.02.06 Stormwater Facilities (See Attached Engineer/Surveyor drawings)*

*5.02.07 Erosion and Sediment Control Plan (See Attached Spec Sheets)*

*5.02.08 Landscaping Plan (Not Applicable)*

*5.02.09 Other Required Drawings (See Attached Engineer/Surveyor drawings)*

*5.02.10 Required Maps (See Attached: Official Zoning Map, Parcel Map, FIRM)*

## 5.03 PROJECT WORKPLAN

The project is anticipated to be performed in four phases, in sequential order with some overlapping tasks. It will entail site preparation and mobilization, demolition and earth work, construction and finally demobilization and cleanup.

**Phase 1 – Site Preparation**

This phase will consist of mobilization and initial survey and staking. After layout determination and establishment, Erosion & Sediment control will be set up, along with Traffic and Pedestrian Control Plan that will follow Maintenance of Traffic (MOT) requirements set forth by USDOT. Mobilization of machinery and equipment will follow proper site setup for safety and protection of workers and environment.

*Approximate Timeline – 7 days*

**Phase 2 – Demolition**

This phase will begin with initial site clearing and basic grubbing to prepare for demolition. Vegetation will be removed and sent to the WMA Transfer station for green waste. Demolition of the culvert, headwall and existing damaged road structure will occur next, with C&D waste disposed of in the Anguilla Landfill via permitted dump trucks. After full demolition and removal of C&D waste, grading and excavation of soil and substrate will commence to prepare new structures for installation.

*Approximate Timeline – 14 days*

**Phase 3 – Earth and Culvert Construction**

This phase will entail construction and embankment shaping and setting, culvert installation and headwall casting. Inlet and Outlet modification and installation will complete the infrastructure layout.

*Approximate Timeline – 14 days*

**Phase 4 – Roadway Construction**

This final phase will focus on roadway construction and profile. Aggregate base will be laid over newly installed infrastructure. New safety guardrails will be installed according to included site plan drawings, and final asphalt layers will be applied per road construction specifications, to provide correct profile for safe driving conditions and to allow for proper drainage and storm resistance. Finally, installation of signage and pavement markings will complete the construction work, and the site will be stabilized and closed through any necessary landscaping and site cleanup as required by environmental standards and regulation.

*Approximate Timeline – 14 days*

All work on this road project will follow Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, as well as local building, environmental and safety regulations.

**Total estimated time for construction completion is estimated at 49-56 days.**

# 6.00 SETTING AND PROBABLE IMPACT ON THE NATURAL ENVIRONMENT

## 6.01 CLIMATE AND WEATHER

### *Prevailing Winds*

The Virgin Islands lie in the "Easterlies" or "Trade Winds" that traverse the southern part of the "Bermuda High" pressure area, and the predominant winds are usually from the east-northeast and east (IRF, 1977). These trade winds vary seasonally and are broadly divided into 4 seasonal modes: 1) December to February; 2) March to May; 3) June to August; and 4) September to November. Below are the characteristics of these modes as taken from Marine Environments of the Virgin Islands Technical Supplement No. 1 (IRF, 1977), and based on U.S. Naval Oceanographic Office data.

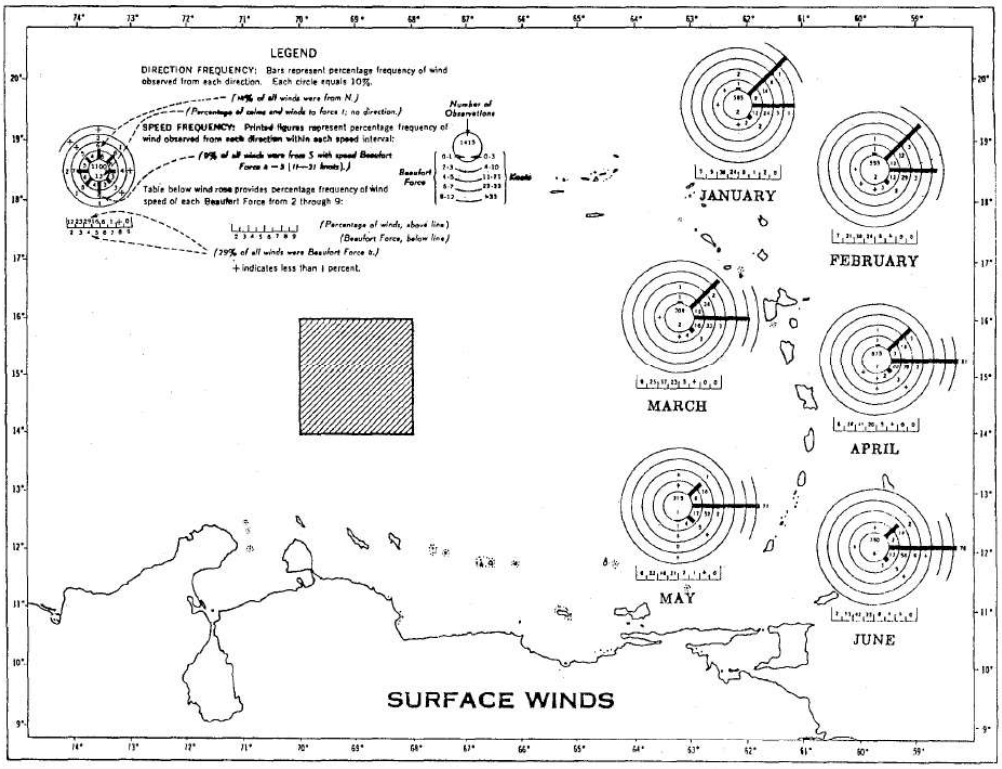



*Figure 6.01.1 –Wind Direction and Speed Frequency, Central Caribbean, January – June.*

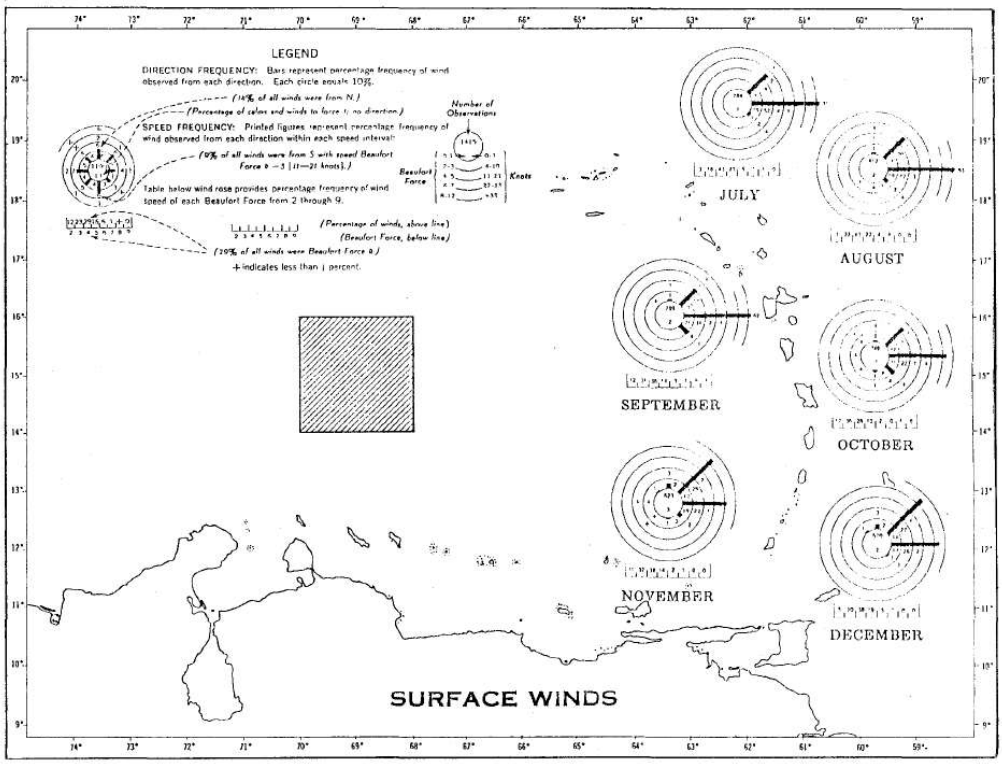



*Figure 6.01.2 –Wind Direction and Speed Frequency, Central Caribbean, July – December.*

*December - February*

During the winter, the trade winds reach a maximum and blow with great regularity from the east-northeast. Wind speeds range from eleven to twenty-one knots about sixty percent of the time in January. This is a period when the Bermuda High is intensified with only nominal compensation pressure changes in the Equatorial Trough. The trade winds during this period are interrupted by "Northerners" or "Christmas Winds," which blow more than twenty knots from a northerly direction in gusts from one to three days. Such outbreaks average about thirty each year. They are created by strengthening of high-pressure cells over the North American continent, which, in turn, allow weak cold fronts to move southeastward over the entire Caribbean region. These storms are accompanied by intermittent rains, clouds and low visibility.

*March - May*

During the spring, the trade winds are reduced in speed and blow mainly from the east. Winds exceed twenty knots only thirteen percent of the time in April. The change in speed and direction is the result of a decrease of the Equatorial Trough.

*June - August*

Trade winds reach a secondary maximum during this period and blow predominantly from the east to east-southeast. Speeds exceed twenty knots twenty-three percent of the time during July. The trend for increasing winds results from the strengthening of the Bermuda High and a concurrent lowering of the pressure in the Equatorial Trough. Trade winds during this period are interrupted by occasional hurricanes.

*September - November*

During the fall, winds blow mainly from the east or southeast and speeds reach an annual minimum. Only seven percent of the winds exceed twenty knots in October. The low speeds result from a decrease in the Equatorial Trough. During this period, especially during late August through mid-October, the normal trade wind regime is often broken down by easterly waves, tropical storms and hurricanes.

## *Storms and Hurricanes*

There are numerous storm events each year, from squalls and thunderstorms to hurricanes. Standard rain events occur most frequently during the summer, lasting only a few hours and causing no pronounced change in the trade winds.

A tropical cyclone whose winds exceed 74 miles per hour is termed a hurricane in the northern hemisphere and can range in strength from causing little to no damage, to destroying. These hurricanes occur most frequently between August and mid-October with their peak activity occurring in September.

Figure 6.01.3 depicts NOAA data on historic Hurricanes and Tropical Storms in the vicinity of St. Croix.


*Figure 6.01.3 – Historic Tracks of Hurricanes and Tropical Storms for St. Croix*

## *Climate*

The climate of St. Croix, as well as that of the Territory, is characterized by generally fair, tropical weather, with usually consistent wind speed and direction. Temperature swings are narrow, both seasonally and diurnally.

The closest weather station to the facility is located at the Henry E. Rohlsen Airport. Climate data from this station is found below in Table 6.01.1.

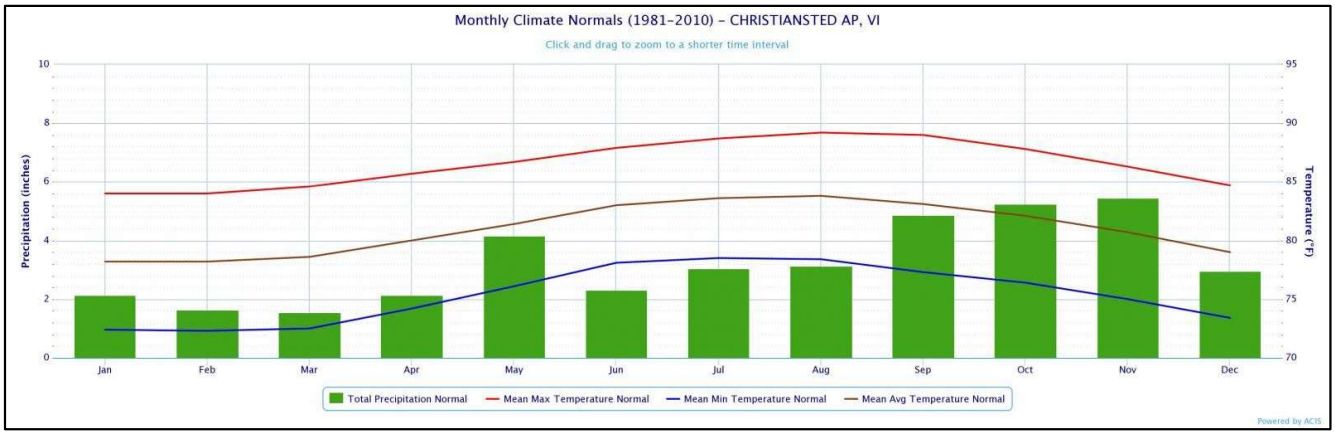



*Table 6.01.1 –Average Temperatures in Christiansted, St. Croix*

The nearest NOAA National Ocean Service Weather Station is located in Christiansted Harbor, St. Croix (Station CHSV3 – 9751364; ndbc.noaa.gov/station_page.php?station=chsv3). Climate data from this station is found below in Tables 6.01.2 and 6.01.3 below.

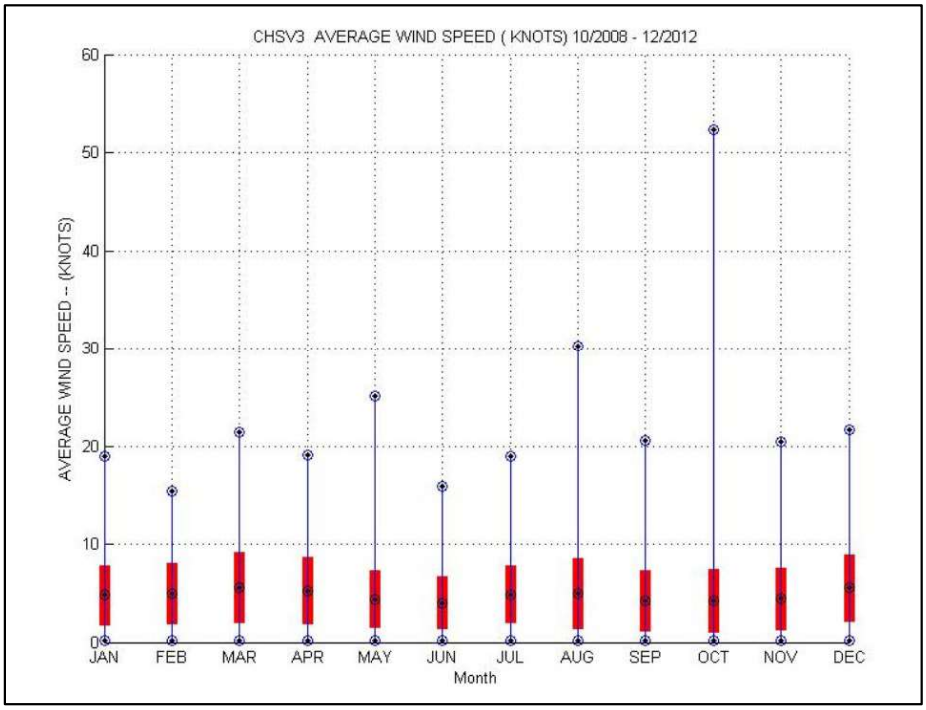



*Table 6.01.2 – Average Wind Speed, St. Croix*

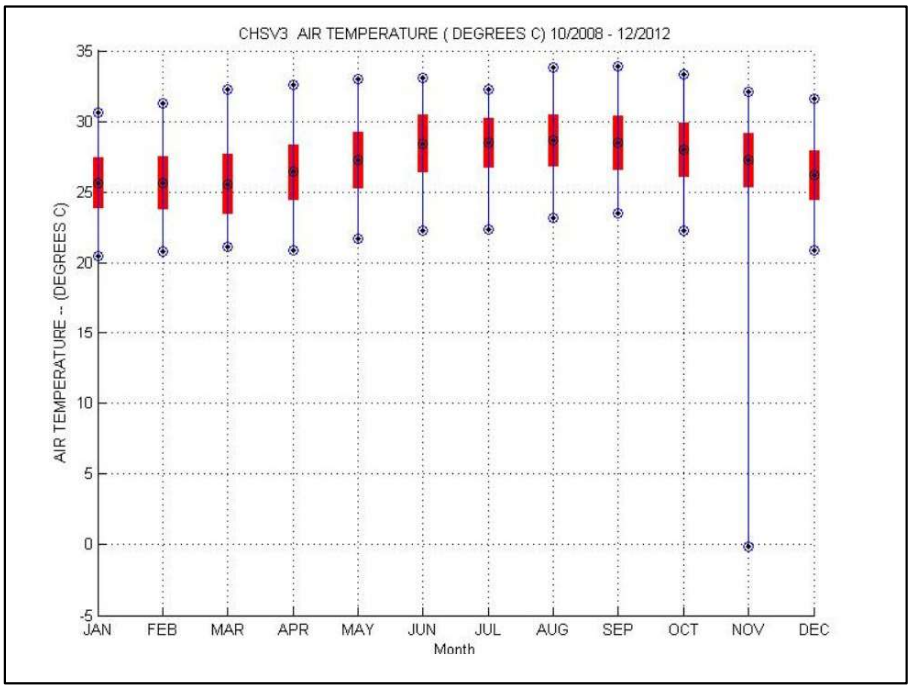



*Table 6.01.3 – Average Air Temperature, St. Croix*

The average annual rainfall on St. Croix is about 40 inches, ranging from about 30 inches in the east to more than 50 inches in the mountains of the northwest. Average annual temperature is a moderate 79°F, with an average low in winter of 76°F and an average high in summer of 84°F; temperatures are 2 to 3 degrees lower at altitudes of 800 to 1,000 feet. Occasionally maximum daily temperatures will exceed 90°F and minimum temperatures will be less than 70°F. Prevailing wind direction is from the east or northeast.

Rain generally occurs in brief, intense showers of less than a few tenths of an inch. Rains exceeding 1 inch in 48 hours occur about 7 or 8 times a year in the central part of the island; they are slightly more frequent in the mountains of the northwest and less frequent in the eastern part. February and March are the driest months and September is the wettest. Nearly half the average annual rain falls from August through November. Large storms can occur in any month although more likely during July to November, the hurricane season. (Jordan, 1975).

### *Impact on the Proposed Project*

The applicant has carefully analyzed both climate and weather. The project and road rehabilitation have been designed to withstand Category V hurricane events and prevailing climate.

## 6.02 LANDFORM, GEOLOGY, SOILS AND HISTORIC LAND USE

### *Geology of St. Croix*

St. Croix is the southernmost island of the U.S. Virgin Islands, lying 40 miles south St. Thomas and separated from it by an ocean trench 3,600 meters deep. It lies about 95 miles southeast of San Juan, Puerto Rico. St. Croix is the largest island in the USVI, with a total area of 82 square miles. The island is approximately 22 miles long, east to west and is about 7 miles in width. St. Croix is geographically located in the Lesser Antilles and lies completely within the Caribbean Sea.

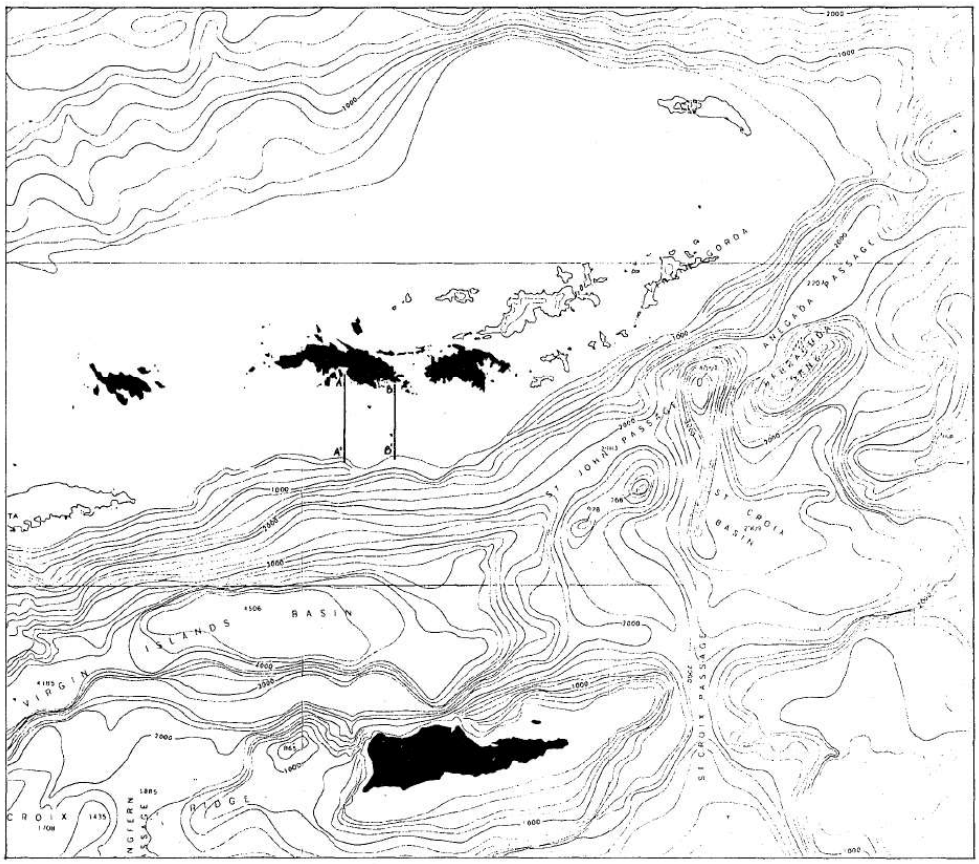



*Figure 6.02.1 – Bathymetry of USVI basins and plateaus. From van Eepoel, et al, 1971.*

The Virgin Islands are near the northeastern corner of the present Caribbean Plate, a relatively small trapezoidal-shaped plate which is moving eastward relative to the North and South American continents carried on the American Plate. The arc of the Lesser Antilles is an active volcanic arc above a subduction zone in which Atlantic oceanic crust of the American Plate is carried downward under the Caribbean Plate. The Caribbean Plate is sliding past North and South American plates along east-west trending northern and southern boundaries. The western boundary is a subduction zone in which the Cocos Plate is being driven northeastward and down under the edge of the Caribbean Plate west of Central America (Rogers, 1988).

St. Croix lies on a somewhat isolated, submerged ridge separated from the Puerto Rico Bank by the Virgin Islands Basin. Geologically it is related to the islands of the Puerto Rico Bank. If St. Croix was ever connected to the northern Virgins, it may have been separated from that group by either block (Meyerhoff 1927, Whetten 1966) or shear faulting (Adey 1977, Turner 1971).

The oldest rocks exposed on St. Croix are epiclastic volcanic sandstone and mudstone of the Caledonia Formation (Whetten 1966). These weakly metamorphosed, uplifted, folded and faulted rocks were derived from volcanic and other narrow-trench sediments originally

deposited by turbidity currents on the deep ocean floor about 70 to 80 million years ago (Adey 1977). Buck Island is an emergent part of the St. Croix shelf.

Somewhat later in the Cretaceous, one or more volcanoes formed on the sea floor to the south or southeast of St. Croix. Volcanic debris was shed northward to form the Judith Fancy formation, composed of tuffaceous sedimentary rocks, which occur on St. Croix but not on Buck Island.

St. Croix was uplifted above sea level in the Oligocene (Whetten 1974), originally as two islands. The East End Range (including proto-Buck Island) and the Northside Range were separated by a trough several miles wide. The trough was subsequently filled in by the deposition of the Kingshill marl formation. There then followed a period of mild deformation, post-Miocene uplift, and erosion to form the present-day topographic features (Rogers and Teytaud, 1988). Therefore, the island of St. Croix consists geologically of two predominant mountainous areas (the North side and the East End ranges), with a central sediment filled valley in between.

The limestone and marls that overlay the Jealousy formation are known as the Kingshill formation. After these formations were deposited, the area underwent another period of uplifting, the two islands became connected by the newly emergent filled-in area, and the island of St. Croix was formed. Since that time, geologic activity has been limited primarily to the erosion of sediments and the formation of ponds, beaches, reefs, and beach rock coast.

Two large basins, the Virgin Islands Basin and the St. Croix Basin, separate St. Croix from the other Virgin Islands. Within the distance between St. Croix and St. Thomas, about 40 nautical miles, hydrographic charts show that the ascent from the sea floor north of St. Croix is as much as 70º. Frasetto and Northrop (1057) indicate that this northern topographic slope extends downward to the Virgin Islands Basin at a gradient up to 43º. There is an ascent of 13,656 feet within a horizontal distance of 25,800 feet, terminating with the steep north coast in the vicinity of Hams Bluff.

The area has been described as the south side of the Anegada Trough and its related fault scarp (Taber 1922). Meyerhoff (1927) suggested that this block faulting took place during the late Pliocene or early Pleistocene, prior to which St. Croix was physically attached to the northern Virgin Islands.

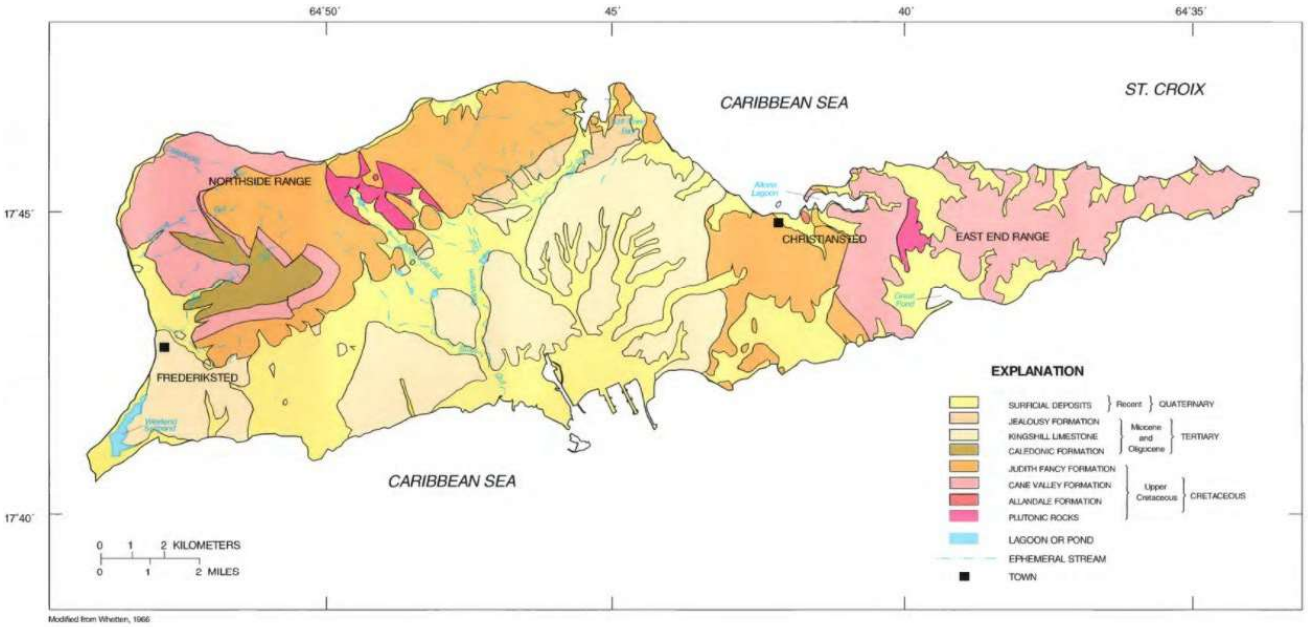
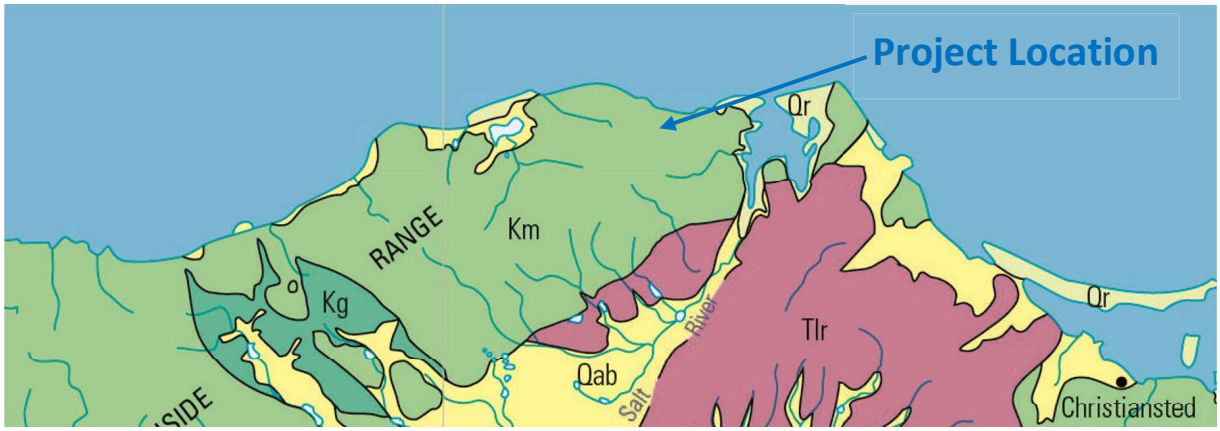



*Figure 6.02.2 – General Geological formations of St. Croix. Atlas of Ground-Water Resources in Puerto Rico and the U.S. Virgin Islands*




**EXPLANATION**

**Quaternary deposits**

Qab — Alluvium, minor beach deposits

Qr — Reef

**Pliocene rocks**

Tbf — Blessing Formation

**Miocene rocks**

Kingshill Limestone

Tmb — Mannings Bay Member

Tlr — La Reine Member

**Cretaceous rocks**

Igneous intrusive rocks

Kg — Gabbro

Kd — Diorite

Km — Mt. Eagle Group

Contact—Dashed where inferred

*Figure 6.02.3 –Geological formations in vicinity of project site, St. Croix. Donnelly, 1959.*

## *Geology of the Facility/Site*

The Rt. 80 East Culvert project site is located in St. Croix, Estate Clairmont (East). The site is positioned at 17°46'47.9"N, 64°46'19.9"W, on Route 80, west of Salt River Bay. The Custom Soil Survey by the National Resource Conservation Service (NRCS) identifies the soil type for the project area as Victory-Southgate complex and Cramer-Victory complex.

Victory-Southgate complex (VsF) with slopes of 40 to 70 percent slopes are rarely flooded. These deep, well-drained soils are made up of approximately 10 inches of loam, then another 22 inches of very gravelly loam, after which it turns to bedrock. Cramer-Victory complex (CvE) with slopes of 20 to 40 percent slopes are rarely flooded. These are also deep, well-drained soils and are made up of approximately 10 inches of gravelly clay loam, then another 10 inches of gravelly clay, after which it turns to bedrock.

The project area is limited only to CvE soils at this time. Elevation varies from 60 to approximately 70 feet above sea level.


*Figure 6.02.4 – MapGeo Soil Type Map*

## *Historic Use*

The land has been used as a transportation parcel for as long as records have been kept on historic uses.

## *Seismic Activity*

The project will be built to meet or exceed the Standard Specifications for the Construction of Roads and Bridges on Federal Highway Projects requirements for Risk Category IV.

The Puerto Rico/Virgin Islands region is located at the northeastern corner of the Caribbean plate where motions are complex. The westward-moving North American plate is being driven under the Antilles Arc where volcanism is active. On the north side of the plate corner, the North American plate slides past the Caribbean but irregularities in the plate boundaries cause stresses that result in a complicated under thrusting of plate fragments. The interaction of plates causes the volcanism of the Antilles Arc on the eastern boundary of the Caribbean plate and creates major stresses all along the northern boundary (Nealon & Dillon, 2001).

Since the 1867 quake, there has been continuous low intensity activity all below 6.0 Richter. Over the last several years, numerous minor tremors have been felt on the island. This increased activity is associated with the volcanic eruptions that have been occurring to the southeast on the island of Montserrat.

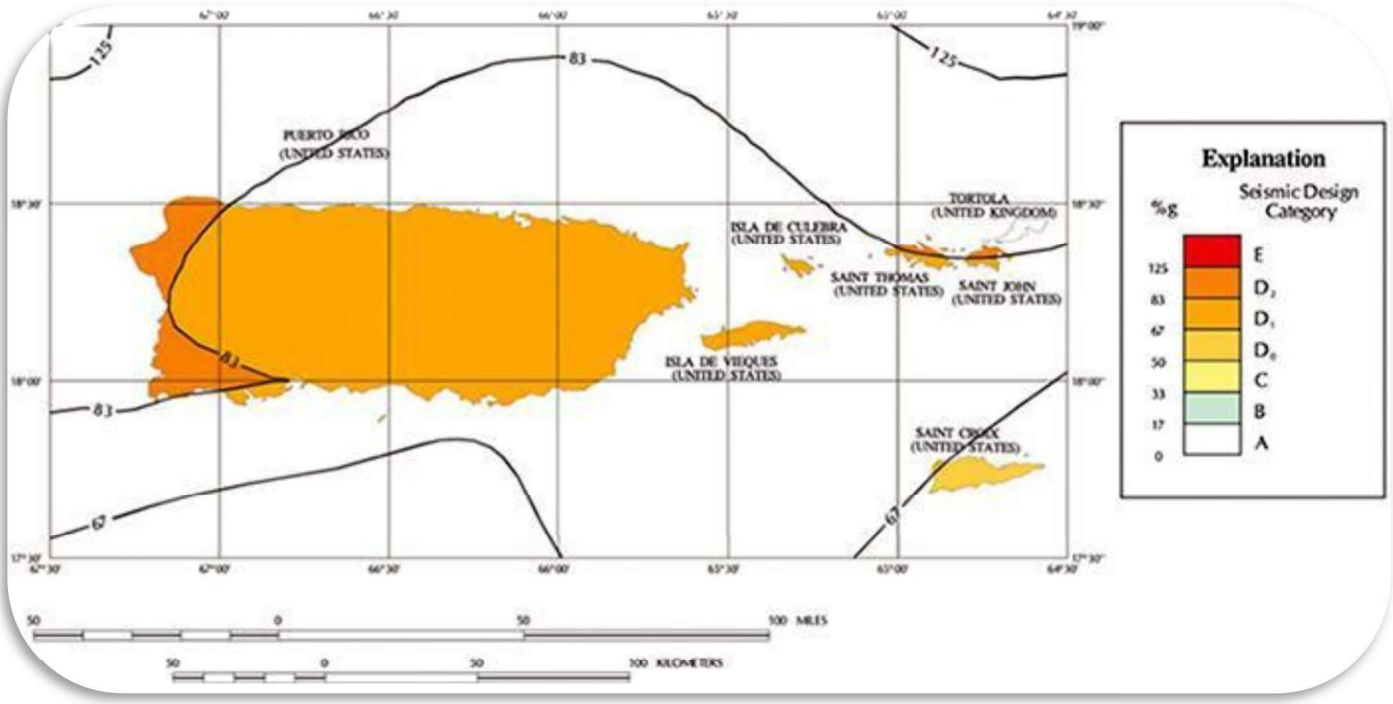



*Figure 6.02.5 – FEMA Seismic Design Category Map*

## *Impact of Geology on Proposed Project*

The applicant has carefully considered landform, geology, soils and historic land use. The project has been designed consistent with these conditions, to improve the landform as it exists now and will cause minimal to no impact on the surrounding area and geology.

## 6.03 DRAINAGE, FLOODING AND EROSION CONTROL

### *a) Drainage Patterns*

The runoff from culvert drainage currently flows through privately owned property. This drainage route is expected to be maintained with no alterations. Most drainage in this area consists of shallow concentrated flow due to the steep slopes and vegetated area.

### *b) Proposed Alterations to Drainage Patterns*

There are no proposed alterations to drainage patterns. The only change to drainage and storm water flow is to increase the culvert cross-sectional area and reinforce the spillway and outlet structure to ensure washout does not occur in the future.

### *c) Relationship of Project to Coastal Floodplain*

Review of Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for U.S. Virgin Islands Index indicate that the project area is completely outside of any flood zone. The nearby zone, immediately along the shoreline, is VE where 100yr storm elevations with velocity (wave action) have been determined to be 12 feet.

See below in Figure 6.01.1, which is a portion of FIRM Panel 0059G, increased in size, depicting exact site location relative to flood zones.

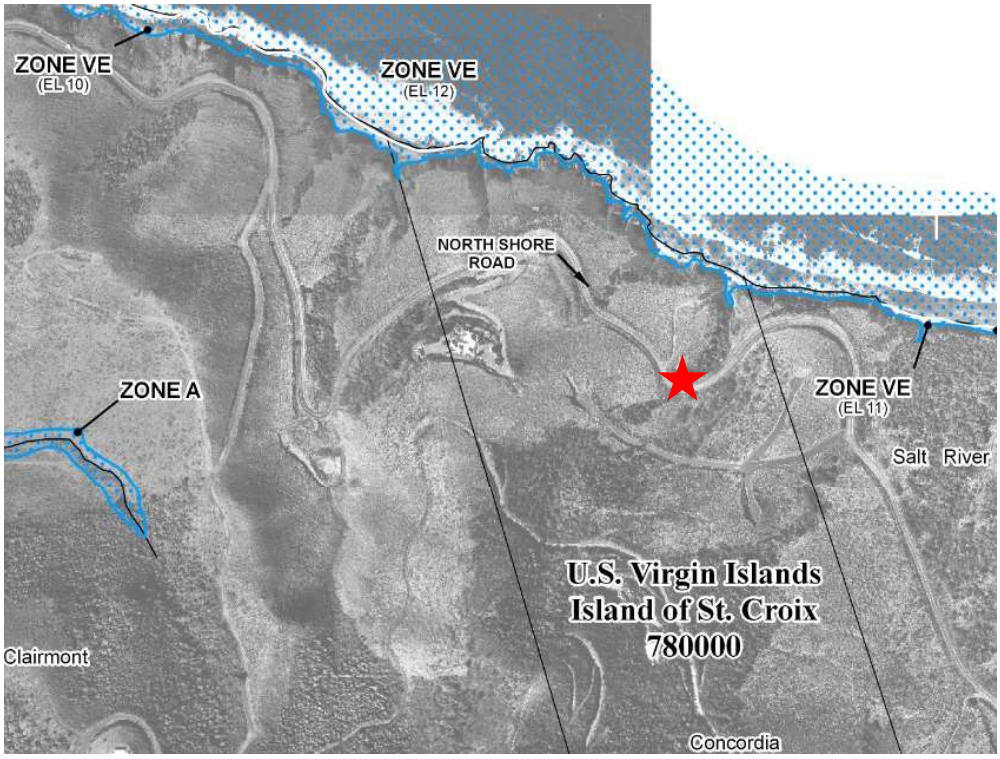



*Figure 6.01.1 – Section of Flood Insurance Rate Map (FIRM) Panel 0059G, 59 of 94. April 16, 2007*

## d) Peak Stormwater Flow Calculations

Included with this Flood Hazard Permit Assessment Report is a hydrology study along with culvert design calculations. The following table notes the Peak discharge rates for the 1-yr thru 100-yr 24-hour storm events.

| PEAK DISCHARGE RATE TABLE | | | | | | | |
|---|---|---|---|---|---|---|---|
| Storm Frequency | 1 YR | 2 YR | 5 YR | 10 YR | 25 YR | 50YR | 100YR |
| Peak Discharge Rate (cfs) | 32.72 | 43.84 | 54.84 | 62.13 | 78.55 | 93.72 | 105.79 |
| Rainfall Intensity (in/hr) | 2.38 | 3.19 | 3.99 | 4.52 | 5.20 | 5.69 | 6.16 |

Rational Method (LAT:17.779883, LON:-64.772178)

*Figure 6.01.2 – Peak Discharge Rates for 1-yr thru 100-yr 24-hour storm events.*

These calculations assume a Runoff Coefficient of 0.8, Time of Concentration of 17 minutes, and overall contributing watershed area of 17.17 acres.

## e) Existing Stormwater Disposal Structures

The only known existing stormwater disposal structure is a 48-inch CMP culvert which will be replaced as scoped for this project. This existing pipe has a capacity of 43.26 CFS, meaning any flow greater than 43.26 CFS will overtop the road.

## f) Proposed Stormwater Control Facilities

This project proposes to remove the existing abovementioned CMP culvert and replace it with three 36-inch HDPE pipe culverts. A new headwall and inlet structure will be installed, along with gabion baskets and additional rip rap placed at the culvert outlet. The proposed triple culvert structure will convey up to 93.72 CFS, which includes the 50-year 24-hour storm event.

No proposed changes to stormwater flows, quantities or direction are proposed for this project, with the exception of the above reinforcement and repair work. A Hydrology report has been provided and was used to determine the adequate sizing of the replacement culvert. Management of stormwater for the duration of the project will be limited to ensuring no discharge of contaminated stormwater from the site boundaries, and prevention of erosion of project areas through controlled release from site discharge points.

## g) Maintenance Schedule for Stormwater Facilities

During construction, sediment control devices, including dikes swales, and outlets, will be inspected every 14 calendar days and after any heavy rainfall of 0.25 inches or more. If defects or damage are noted in the measures, the defect or damage will be immediately reported and repaired. The designs of any measures that prove to be inadequate to control erosion, will be changed and additional measures will be added as necessary.

Accumulated sediment will be removed when it reaches 40% of the height of the silt fencing, and in accordance with the approved SWPPP requirements. Worn, torn or otherwise damaged silt fencing will be fixed or replaced. The site will be cleaned on a daily basis of litter, debris and materials such as paper, wood, concrete, etc.

After construction is complete, a maintenance schedule will be prepared and submitted to the VI Department of Public Works for use in their routine O&M plan for stormwater infrastructure.

## *h) Proposed Method of Land Clearing*

Any brush and debris requiring removal in order to access the existing road and related infrastructure, will be cut and transported off-site as green waste for disposal at the Waste Management Authority Transfer Station.

## *i) Provisions to Preserve Topsoil and Limit Site Disturbance*

Topsoil and site disturbance will be minimized during the construction timeline. The project will focus within the existing footprint of the road along the 332-foot length as depicted in the site drawings.

Some soil removal and compaction will occur to stabilize for the additional rip rap placement, but will be protected and stabilized throughout the project timeline. The site will otherwise see no topsoil or site disturbance.

A Storm Water Pollution Prevention Plan (SWPPP) complying with the Department of Planning and Natural Resources' Construction General Permit requirements will be implemented during project activities.

## *j) Critical Areas and Possible Trouble Spots*

The project area is in a semi-rural section along the north shore of St. Croix, with few developed properties in the area. However, the roadway is less than 500 feet from the shoreline. Due to the proximity to the water, the clearing of debris and repair of the roadway must not cause any impact to the surrounding areas, existing habitats or wildlife.

Site slope is 20-40%. Elevation is approximately 65 to 80 feet above sea level.

A review of the U.S. Fish & Wildlife Information for Planning and Consultation (IPaC) indicate two federally endangered reptile species that are known to swim in the offshore waters, less than 500 feet north of the project area. They are the hawksbill sea turtle (*Eretmochelys imbricata*) and the leatherback sea turtle (*Dermochelys coriacea*). In addition, the West Indian manatee (*Trichechus manatus*) is a threatened species and has been found in the offshore waters near the project site as well.

There is no data for water quality in the area as there have been no recent water samples taken in the area. The USVI_2018 303d list show no samples taken from the subject water body in recent years.

Due to the nature of the project scope of road rehabilitation, there exists potential for sedimentation and erosion during project activities. However, appropriate protective BMPs will be employed through the entire project timeline in accordance with minimum requirements of the VI Environmental Protection Handbook (2002). As the project footprint is essentially identical to the existing infrastructure, there are no anticipated impacts to stormwater and air quality.

These BMPs chosen will meet the minimum standards of the VI Environmental Protection Handbook (2002).

## *k) Erosion and Sediment Control Devices to be Implemented*

The following Best Management Practices (BMPs) will be implemented on the site to control runoff and protect natural resources:

**Silt Fence –** Due to the steep slopes and working in a drainage route, silt fencing shall be used to protect the downstream vegetated areas and control runoff and sediment loss on the north side of the road.

**Containment Berms –** A containment berm will be constructed, if needed, to support silt fencing in containing stormwater and retaining sediment.

Design of these BMPs will follow the minimum standards of the VI Environmental Protection Handbook (2002).

## *l) Maintenance of Erosion and Sediment Control*

Sediment control devices, such as dikes, swales, outlets and other BMPs will be inspected every 14 calendar days and after all heavy rainfall of 0.25 inches or more. If defects or damage are noted in the measures, the defect or damage will be immediately reported and repaired. If the measures prove to be inadequate to control erosion, changes will be made to the design and additional measures will be added as necessary.

Accumulated sediment will be removed when it reaches 40% of the height of the silt fencing. Worn, torn or otherwise damaged silt fencing will be fixed or replaced.

The site will be cleaned on a daily basis of litter, debris and materials such as paper, wood, concrete, etc. The site will be cleaned on a daily basis of litter, debris and materials such as paper, wood, concrete, etc.

### *m) Impacts to Terrestrial and Shoreline Erosion*

The project area is in a fairly rural section in northern St. Croix, in Estate Clairmont (East). The watershed terrain is sloped, well vegetated, and has very little exposed soils. The project site boundary itself, which is essentially the road section, is fully developed consisting of 95% of either impervious asphalt or flat packed earth surface.

The proposed development will not alter the existing drainage patterns of the site. The only change to drainage and storm water flow would be the replacement of the existing culvert with different material, allowing faster flow through the structure. This impact, however, is minor and offset with reinforced riprap inlets and outlets. Runoff currently flows to the northeast, through privately owned property, toward the nearby shore.

Silt Fencing will be set up with reinforcing berms as needed to ensure catchment of direct runoff from the project area, thereby minimizing potential impact to receiving waters.

All standard sediment and erosion control devices and BMPs will be implemented when performing any site work and will be maintained throughout the life of the project. Permanent BMPs shall be maintained by DPW according to standard practices on a regular schedule and after storm events.

These erosion control devices, combined with the receipt of a VI CGP storm water coverage and routine inspections, maintenance and repairs, will ensure no impact to either terrestrial or shoreline erosion.

## 6.04 FRESH WATER RESOURCES

St. Croix, USVI is limited in the amount of freshwater resources to a few wells located around the island and mostly intermittent and ephemeral streams and ponds which dry up during periods of limited rainfall. Some perennial streams and freshwater ponds/basins do exist, but not as a reliable source of freshwater. The majority of potable water is either captured by rooftops and stored in cisterns or is desalinated seawater. The project will use freshwater only for grading, compaction and general dust control needs. The project will have no negative impact on the availability of freshwater resources.

## 6.05 OCEANOGRAPHY

### *a) Seabed Alteration*

No alteration or impact to the existing seabed is anticipated as part of this project and operation.

## *b) Tides and Currents*

The surface currents throughout the Caribbean are driven by the North Equatorial Current that runs through the islands west-northwest and then joins the Gulf Stream (Figure 6.05.a-F.2). These currents change very little from season to season with the currents coming more from the south during the summer months. Because of the shallowness of the Caribbean basin, less than 3200 feet, mainly surface water from the Atlantic flows through the islands (Figure 6.05.1). Currents have been observed at Christiansted Harbor ranging between 1 and 3 knots, depending on weather conditions (IRF 1977).

St. Croix's tides typically exhibit two (bi-modal) 'peaks' during the diurnal period (24-hour day), with the second (lesser) 'peak' with relatively small ebbs and flows. The mean tides range from 0.8 feet to 1.0 feet and the spring tidal ranges reach up to 1.3 feet (IRF 1977).

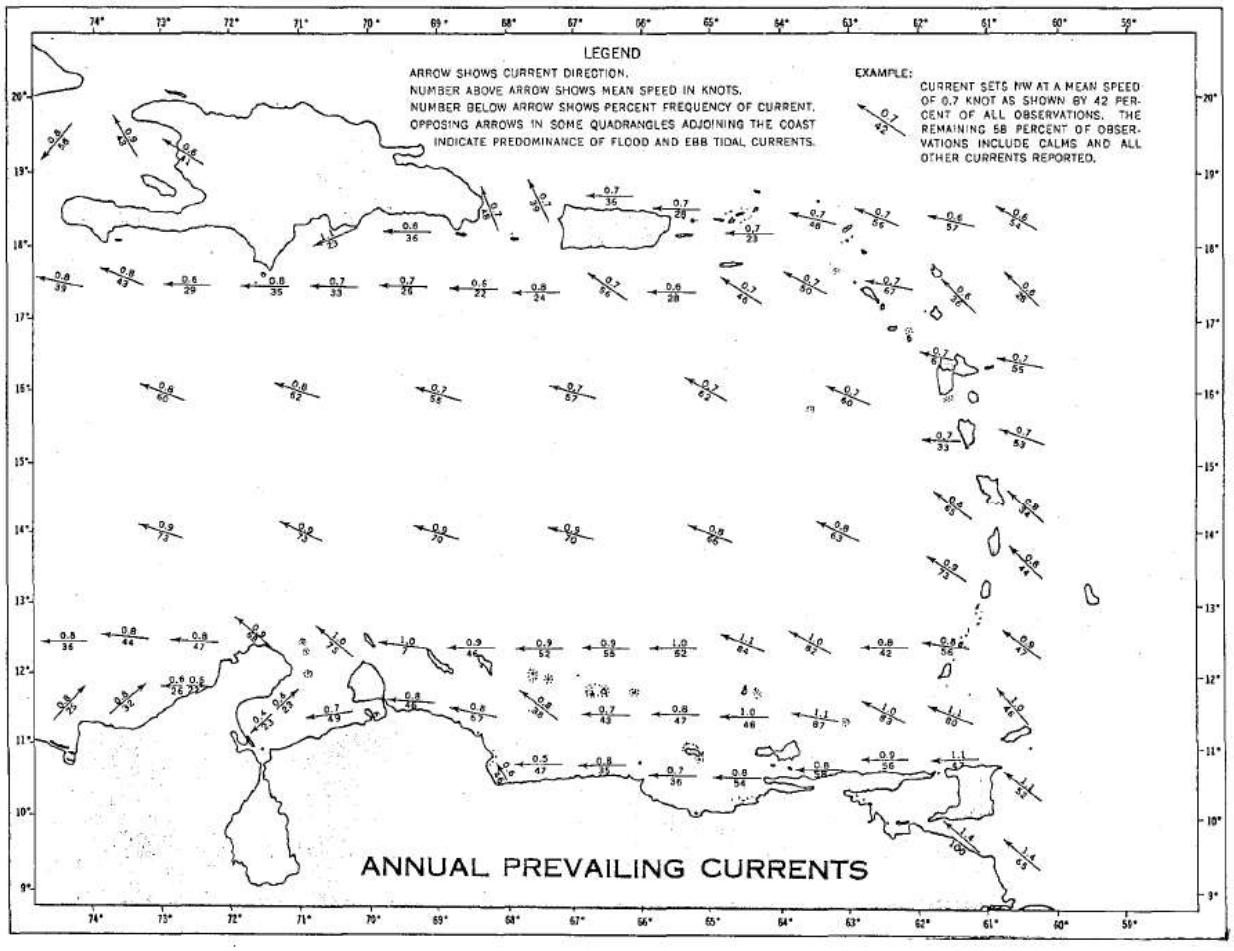



*Figure 6.05.1 – Annual prevailing currents in the Caribbean. US Naval Oceanographic Office (1963)*

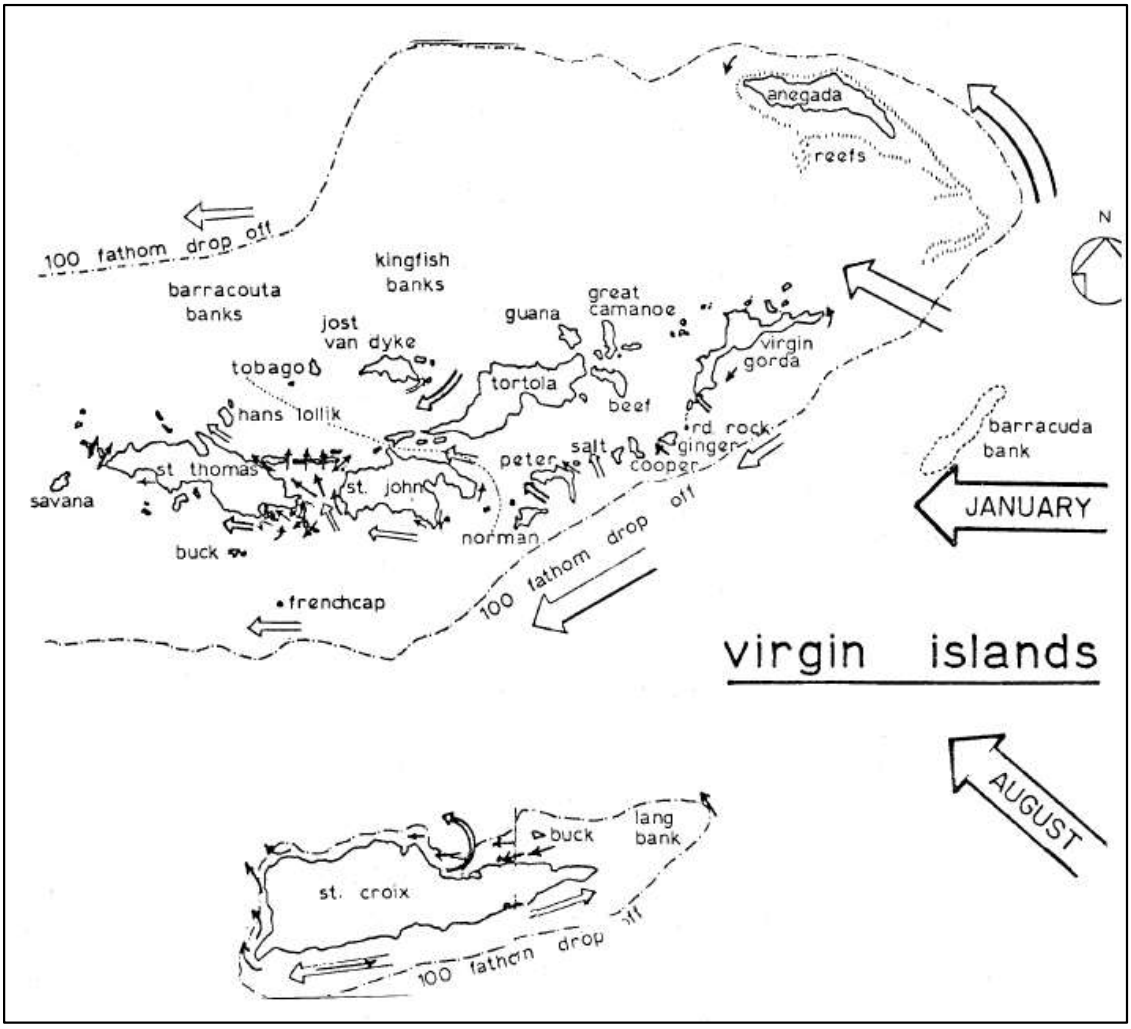



*Figure 6.05.2 – General current patterns on the island platforms. From Dammann, et al (1969)*

In the Virgin Islands, tidal ranges are not great, and tidal currents, except in some inshore localities, are not significant. The small islands, lacking complex shoreline physiography, do not restrict changes in water level. The sea flows around the islands relatively unimpeded, resulting in tidal fluctuations of only a few inches to a foot. Further, the steep slopes of the islands rising out of the water means that the intertidal zone – the part of the shoreline regularly covered and uncovered by the tides - is very narrow. We therefore do not have large areas of tidal flats uncovered at low tides as in other places in the world, especially along continental coastal zones.

One of the consequences of this small tidal action is that water exchange in bays due to tidal action is usually very small. For example, it is estimated that 24 to 40 tidal cycles alone would be necessary to exchange all the water in the main part of St. Thomas harbor (Percious, et al, 1972). Fortunately, waves, swells and oceanic currents usually do a good job of flushing

most bays. However, these forces are considerably reduced by the time they reach the heads of deep embayments.

As a result, circulation may be poor in the inner reaches of some of our larger embayments. The innermost portions of the mangrove lagoon on St. Thomas, of Salt River, St. Croix and of Coral Bay, St. John are like this. To a lesser extent, similar conditions have been observed at the head of Vessup Bay (Redhook), St. Thomas and Cruz Bay, St. John, and probably occurs in other similar locations (IRF, 1977).

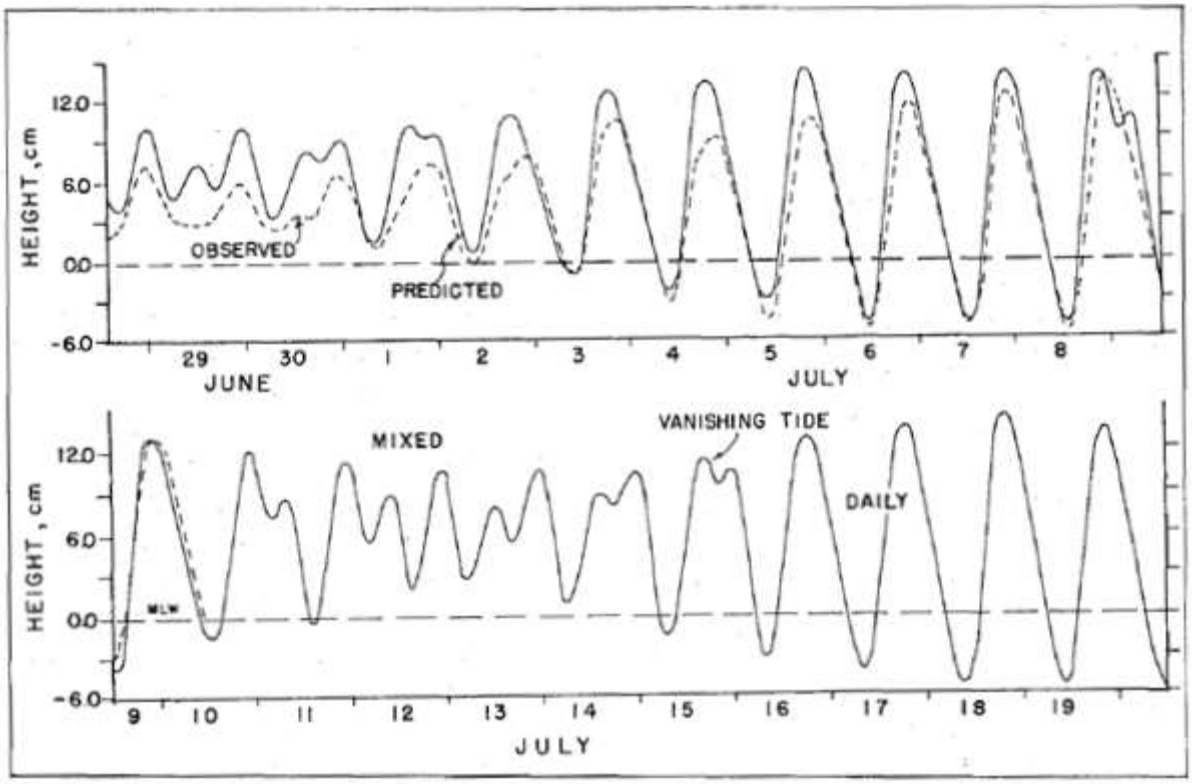



*Figure 6.05.3 – Variations in the character of the tide displayed in time-height curves, from predicted tables and from observed tides in Christiansted harbor, June 29 - July 19, 1971. From Nichols, et. at, 1972.*

The closest NOAA tidal station is located in Christiansted Harbor, St. Croix, VI and is Station ID: 9751364. The NOAA tidal station is located at Latitude: 17° 44.9' N and Longitude: 64° 41.9' W. The mean range is 0.69 ft. and the diurnal range is 0.74 ft. Tidal data from the station is shown below.

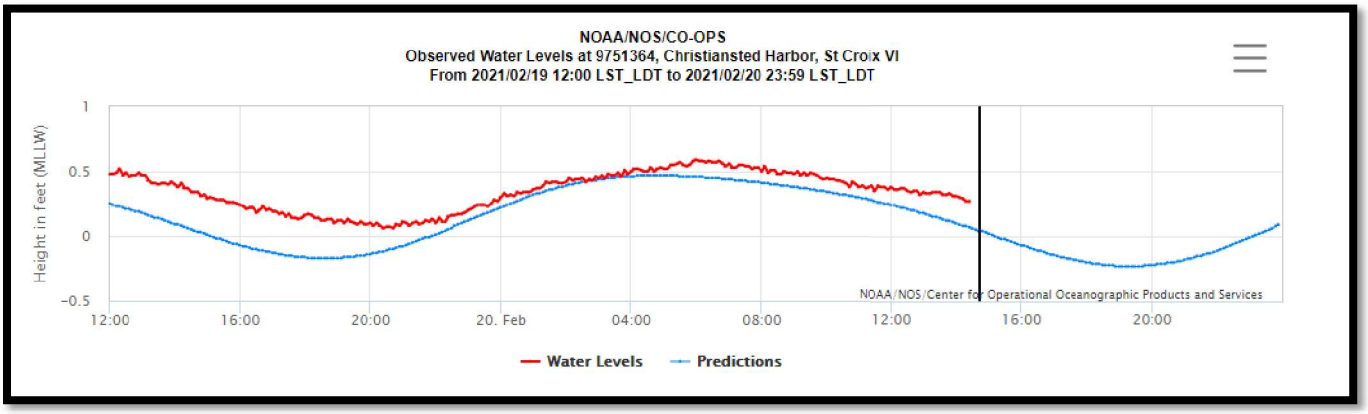



*Figure 6.05.4 – Observed Water Levels in Christiansted, St. Croix*

## c) Wave and Wind Impacts

Due to the location and elevation, there is a possibility of wave or wind impacts for this project and activities. Construction will occur outside of rainy season and hurricane season to minimize potential for wave impacts to the site, but strong winds can still be active year round. Care will be taken to ensure dust control is maintained through wetting of the site, as well as protection of loose soil and stockpiles.

## d) Marine Water Quality

The water surrounding the site is classified as Class B which includes uses such as the propagation of desirable species of marine life and primarily contact recreation such as swimming, water skiing, etc.

The waterbody to the North is Cane Bay, a Class B Water. Water quality criteria, noted in 12 VIRR 186, include dissolved oxygen not less than 5.5 mg/l from other than natural conditions. The pH must not vary by more than 0.1 pH unit from ambient, and at no time may the pH be less than 7.0 or greater than 8.3. Bacteria (enterococci) cannot exceed 30 CFU/100ml (30-day geometric mean), turbidity readings cannot exceed 3 NTUs, and clarity may not exceed a level where a Secchi disc cannot be visible at a minimum depth of one meter.

VI DPNR performs routine water quality measurements at the following Water Quality Monitoring Stations:

| **Waterbody** | Location | Sample Station Number |
|---|---|---|
| **VI-STC-12** | Cane Bay | STC-32, VI207013 |

In VI DPNR's 2018 Integrated Report (IR), which entails CWA Section 305(b) water status report and the CWA 303(d) list, the Cane Bay Assessment Unit is listed as impaired for Turbidity, Dissolved Oxygen, Enterococcus Bacteria and Phosphorous.

A Total Maximum Daily Load (TMDL) for this waterbody has **not** been established due to previous water quality exceedances in the past.

### Impact of the Proposed Project

The applicant has carefully considered operations onsite and how it would affect water quality. Existing operations has been setup carefully to control storm water runoff from the site, and direct all of it to regulated and controlled discharge points.

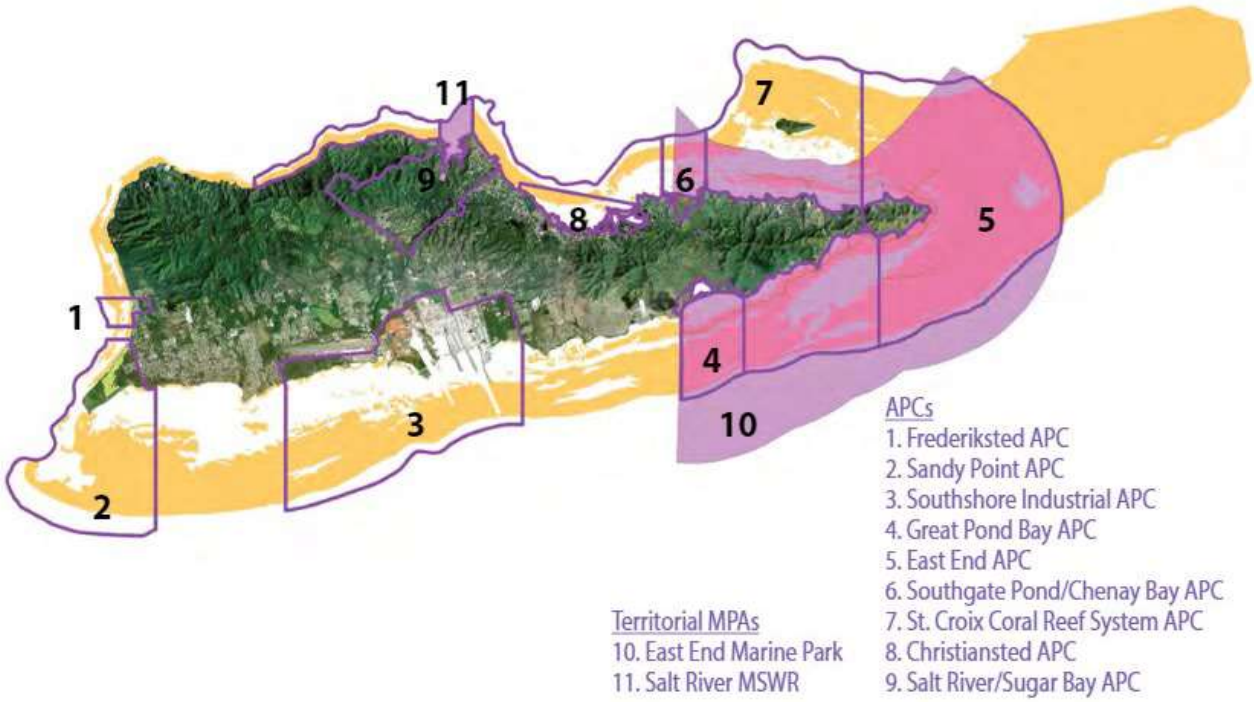
A stringent sedimentation and erosion control plan will be implemented and monitored during the life of the operation. As discussed in Section 5.01, storm water both during construction and after construction will be strictly managed and discharged pursuant to a TPDES storm water permit requiring regular monitoring and reporting to ensure permit compliance.

## 6.06 MARINE RESOURCES AND HABITAT ASSESSMENT

The existing shoreline near the site is mostly composed of vegetation. The direct project area is mostly undeveloped with few nearby residences. There are no commercial nor industrial zones in the area. As such, there are limited anthropogenic sources of pollution.

NOAA and DPNR have established Salt River/Sugar Bay as an Area of Particular Concern (APC) and Marine Protected Area (MPA). Figure 6.02.1 below depicts APCs of St. Croix (purple outlines), including the Salt River/Sugar Bay area (#9) and the Salt River Bay area (#11).

The project area is less than 500 feet from the northern shoreline and approximately one mile from Salt River Bay, though currents and stormwater flow would not direct runoff from the site towards this APC. During construction, VIP will mitigate the effects of soil erosion, sedimentation and trash by following a strict SWPPP addressing those issues to ensure no negative effects to the surrounding environment.




Maps of Areas of Particular Concern (APC; purple outline) and Territorial MPAs (solid purple) of St. Thomas and St. John (top) and St. Croix (bottom). Brown shading represents shallow (<35 m) hard bottom substrate. MSWR= Marine Sanctuary and Wildlife Reserve.

*Figure 6.02.1 –NOAA, NOAA Technical Memorandum NOS NCCOS 187, October 2014*

A review of the 2002 NOAA Benthic Habitat Maps shows the portion of shoreline the project runoff would affect is comprised of Reef/Colonized Pavement or Bedrock in the Bank/Shelf Zone.

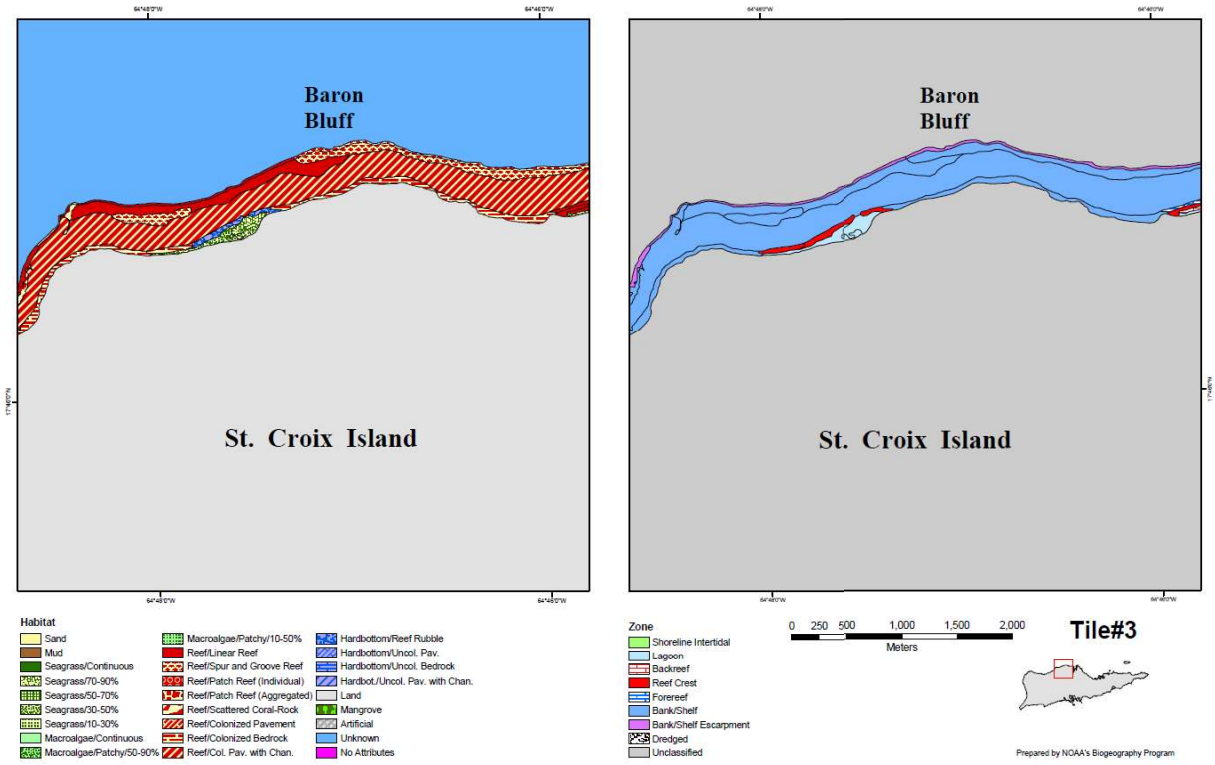



*Figure 6.02.2 – 2002 NOAA Benthic Habitat Maps, Baron Bluff, St. Croix, USVI.*

A review of the U.S. Fish & Wildlife Information for Planning and Consultation (IPaC) indicate two federally endangered reptile species that are known to swim in the offshore waters, less than 500 feet north of the project area. They are the Hawksbill Sea Turtle (*Eretmochelys imbricata*) and the Leatherback Sea Turtle (*Dermochelys coriacea*). In addition, the West Indian Manatee (*Trichechus manatus*) is a threatened species and has been found in the offshore waters near the project site as well.

## 6.07 TERRESTRIAL RESOURCES

The Environmental Sensitivity Index (ESI) Map for the island of St. Croix notes no specific habitat of particular sensitivity in the direct project site area, as show in Figure 6.07.1 below. However, Salt River Bay is home to several birds including the American Oystercatcher, Brown Pelican, Gulls, Least Tern, Osprey, Neotropical migrants, shorebirds, and wading birds.

Site review of the area by Horsley Witten's field ecologist determined that no threatened, endangered or native species were within project boundaries.

Should any critical plant or animal be encountered, staff at VI DPNR – DFW will be contacted immediately at (340) 773-1082.

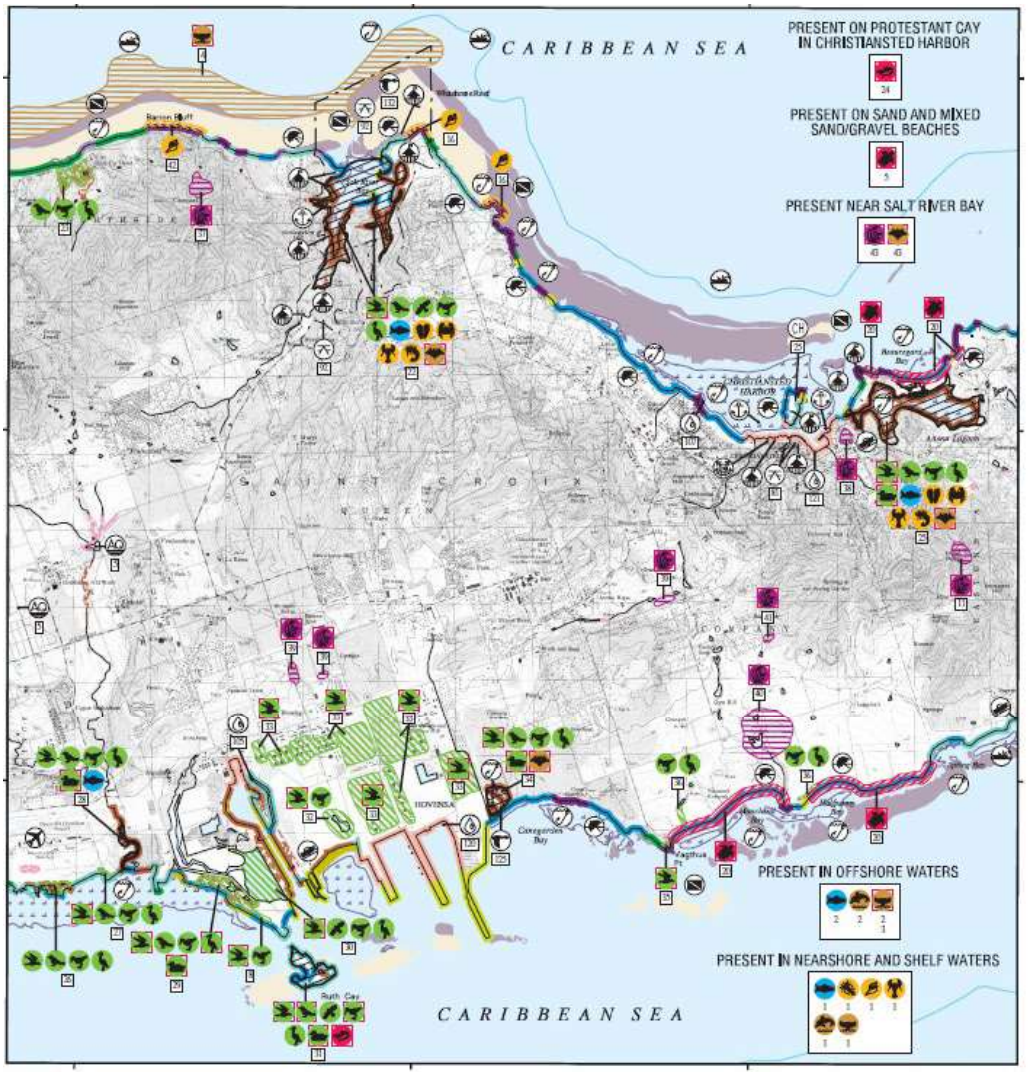



*Figure 6.03.1 – Environmental Sensitivity Index Map, VI-2, St. Croix, USVI.*

## Impact of the Proposed Project

As part of recommendations set by the Section 7 CWA Endangered Species Act consultation with USFWS, VIP will minimize the footprint of work to the greatest extent possible and is not expected to extend farther than necessary beyond the road shoulder to complete repairs.

As the site will not see expansion beyond the existing footprint and compliance with both stormwater and air pollution permits will be ensured through the life of the facility, there are

no anticipated negative impacts to these species or their habitat, neither in the nearshore waters nor on land.

## 6.08 WETLANDS

The U.S. Army Corps of Engineers defines wetlands as "those areas that are periodically inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, bogs, marshes and similar areas." (U.S. Army Corps of Engineers, 1986).

There are no terrestrial wetlands within the project area, though it is within 500 feet of the shoreline.

## 6.09 RARE AND ENDANGERED SPECIES

A review of the U.S. Fish & Wildlife Information for Planning and Consultation (IPaC) indicate two federally endangered reptile species that are known to swim in the offshore waters, less than 500 feet north of the project area. They are the hawksbill sea turtle (*Eretmochelys imbricata*) and the leatherback sea turtle (*Dermochelys coriacea*). In addition, the West Indian manatee (*Trichechus manatus*) is a threatened species and has been found in the offshore waters near the project site as well.

Site review of the area by Horsley Witten's field ecologist determined that no threatened, endangered or native species were within project boundaries.

## 6.10 AIR QUALITY

No air quality issues are anticipated for this project. A minimum of soil exposure and earth movement will occur at the site. Stockpiling will be protected and kept to a minimum. If work is done during particularly dry and/or windy conditions, a water truck can be used to wet down the area to prevent fugitive dust from leaving the site. These water trucks will bring water from the VIP asphalt plant location, or from a commercial water provider. Dust control measures to ensure no air quality issues arise are outlined in the Storm Water Pollution Plan for this project.

# 7.00 IMPACT OF THE PROPOSED PROJECT ON THE HUMAN ENVIRONMENT

## 7.01 LAND AND WATER USE PLANS

The property is a Right of Way (ROW) zoned plot, designated for transportation, which permits the rehabilitation project proposed for this site.

The project will not change the current use of the property as an ROW.

## 7.02 VISUAL IMPACTS

The property is proposed for an existing road and will improve the contour and quality of the road in this section. The project will not change the visual character of the area.

## 7.03 IMPACTS OF PUBLIC SERVICES AND UTILITIES

### *Water*

As noted in Part 6.04, the project will not use or affect significant amounts of water, either from public supply or otherwise. The project will have no negative impact on the availability of freshwater resources.

### *Sewage Treatment and Disposal*

There will be no flow to the municipal sewerage system or required sewer disposal resulting from this project's implementation. As previously referenced, project sewage management will be limited to maintaining portable restrooms.

### *Solid Waste Disposal*

Domestic solid waste will be managed with onsite waste bins. It will be trucked out by VIP as necessary and disposed of in accordance with solid waste requirements.

### *Roads, Traffic and Parking*

The project will affect traffic as the scope of work is to rehabilitate a 150-foot section of the road. Traffic will be minimized with the use of traffic guidance, shoulder passing and a short work schedule.

### *Electricity*

The property will not have any electricity needs related to existing infrastructure.

### *Schools*

There are no anticipated adverse effects on the local educational system.

### *Fire and Police Protection*

Any nighttime work will provide adequate lighting for worker safety. In case of emergency, the site is accessible by the same route.

### *Health*

The property will not have any adverse effect on the public health, nor increase the use of public health facilities. The facility will follow all air permit requirements to ensure air pollution is minimized and does not affect any neighboring properties or businesses.

## 7.04 SOCIAL IMPACTS

There are no anticipated negative social impacts to the area. The north shore is one of the more popular areas for social gatherings, and social activities such as hiking, swimming and scuba diving.

The rehabilitation will address a potentially dangerous collapse of this road, which will ensure access and travel through this essential north shore route.

## 7.05 ECONOMIC IMPACTS

There are no anticipated negative economic impacts.

## 7.06 IMPACTS ON HISTORICAL AND ARCHAEOLOGICAL RESOURCES

This project site shows no indication of historical resources or any historical structures. A clearance was provided to the USDOT by DPNR-SHPO for this project site and the other 14 as part of this overall project scope, and found that no impact to historical resources was anticipated, based on the proposed scope of work and rehabilitation methods.

## 7.07 RECREATIONAL USE

The project will have no impact on the recreational uses within the area. As noted above, traffic to areas in the vicinity will be slowed, but will not be prevented, for the project duration. The project will ensure unimpeded use of the area after the project is complete, to allow for continued recreational activities in the area.

## 7.08 WASTE DISPOSAL

Domestic solid waste will be managed with onsite waste bins. It will be trucked out by VIP as necessary and disposed of in accordance with solid waste requirements.

Chemicals inherent to the asphalt and road construction business will be used daily on site. They will be kept in protected areas and any hydrocarbons will be kept within secondary containment (such as hydraulic or motor oil for machinery).

Any unused or contaminated chemicals or materials, including oily rags or contaminated material, will be disposed of in accordance with waste handing regulations.

The project will have no significant impact on solid waste disposal.

## 7.09 ACCIDENTAL SPILLS

Spills are not anticipated during construction; however, any spills onsite will be cleaned up immediately. Any contaminated soil will be put into approved containers for eventual disposal by a licensed waste handler.

## 7.10 POTENTIAL ADVERSE EFFECTS WHICH CANNOT BE AVOIDED

The project does not involve any potential adverse effects that may not be avoided. The project has been designed to avoid sensitive areas to the greatest extent possible. Potential impacts have been minimized through the development of a stringent sedimentation and erosion control plan which will be implemented during construction and during the life of the site operations.

# 8.00 MITIGATION PLANS

No mitigation plans are needed for this project and operation.

# 9.00 ALTERNATIVES TO PROPOSED ACTION

If the operation does not move forward, the project site and road length will continue to degrade and will create extremely unsafe conditions for drivers, eventually cutting off access through this roadway.

There is no alternative location option, as the damaged section must be repaired, and there are no easy alternative roadways in the area to traverse the length of the north shore.

# 10.00 RELATIONSHIP BETWEEN SHORT & LONG TERM USES OF MAN'S ENVIRONMENT

Any minor potential impacts associated with this project in the short term are far outweighed by the environmental and economic benefits provided in the long-term to repairing this section of road.

# 11.00 REFERENCES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